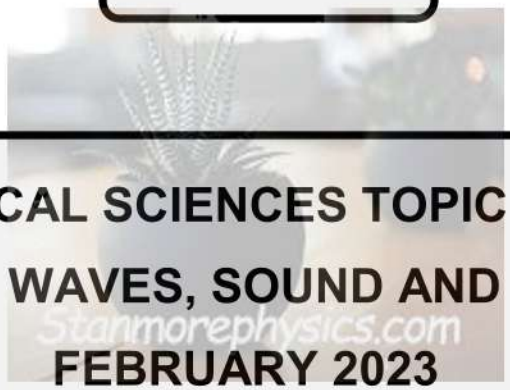
education

DEPARTMENT: EDUCATION
MPUMALANGA PROVINCE

GERT SIBANDE DISTRICT

GRADE 10



PHYSICAL SCIENCES TOPIC TEST

TOPIC: WAVES, SOUND AND LIGHT

FEBRUARY 2023

MARKS: 50

TIME: 1 hour

This question paper consists of 6 pages including the data sheet

Please turn over

INSTRUCTIONS AND INFORMATION

1. Attempt ALL questions.
2. Round off your final answers to a minimum of TWO decimal places.
3. Write neatly and legibly.
4 You are advised to use the attached data sheet.

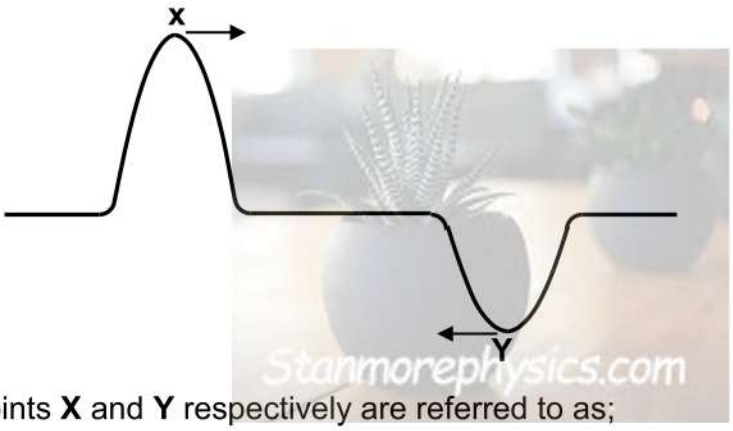
QUESTION 1: MULTIPLE-CHOICE QUESTIONS

Various options are provided as possible answers to the following questions. Each question has only ONE correct answer. Write only the letter (A–D) next to the question number (1.1–1.10) in the ANSWER BOOK. Eg 1.6 E

1.1 Which ONE of the following statements is CORRECT?
All waves …

A are transverse.
B are longitudinal.
C transmit energy.
D travel through a vacuum. (2)

1.2 Two pulses are travelling towards each other along a string, as shown in the diagram below.



The points **X** and **Y** respectively are referred to as;

A Trough and Crest.
B Crest and Trough.
C Crest and Crest.
D Trough and Trough. (2)

1.3 The number of wave pulses per second is defined as the…… of the wave.

A Speed.

B Amplitude.

C Wavelength.

D Frequency. (2)

1.4 Which ONE of the combinations below concerning the pitch and loudness of sound is CORRECT?

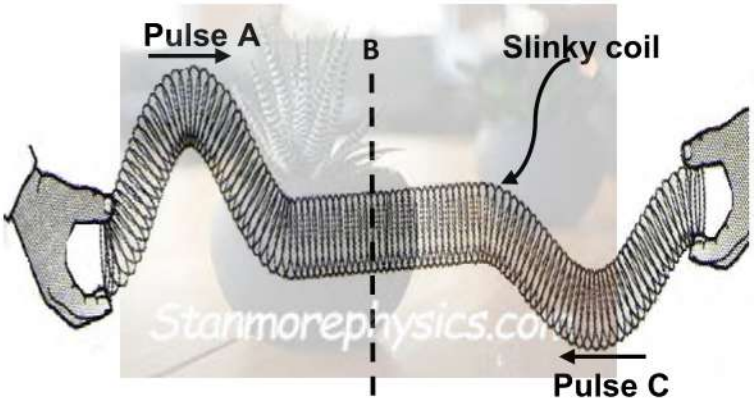
The pitch and loudness of sound depend on:

	PITCH	LOUDNESS
A	Frequency	Amplitude of vibration
B	Frequency	Speed of vibration
C	Amplitude of vibration	Frequency
D	Speed of vibration	Frequency

(2)
[8]

QUESTION 2

In the diagram below, two grade 10 learners demonstrated how pulses move towards each other in a slinky coil.
Pulse **A** has an amplitude of +140 mm, and pulse **C** has an amplitude of – 90 mm. The pulses meet at position **B**. Assume there is no loss of energy.



2.1 Define the term *pulse*. (2)

2.2 Write down the name of the principle that explains what occurs when the two pulses meet at position **B**. (1)

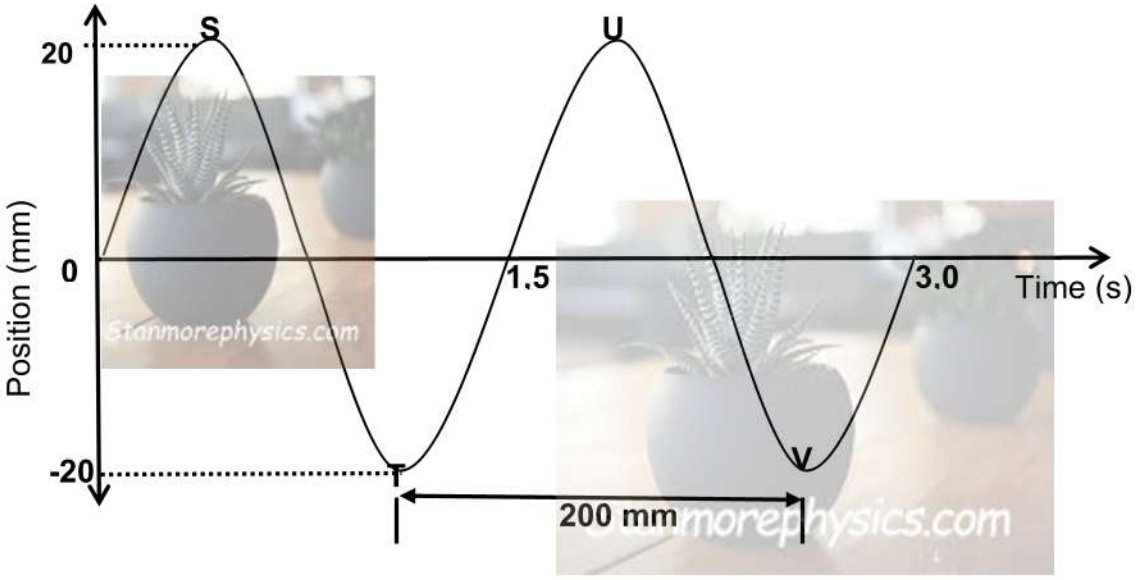
2.3 Define the principle named in question 2.2 above. (2)

2.4 Draw a sketch to show the resulting pulse when pulses **A** and **C** meet at position **B**. Indicate the resulting amplitude on the sketch. (2)

2.5 Pulse **A** travels a distance of 0,8 m in 1,6 s. Calculate the speed of pulse **A**. (3)
[10]

QUESTION 3

The sketch below shows a wave in a medium.



3.1 Identify the type of waves illustrated above as TRANSVERSE or LONGITUDINAL. Give a reason for the answer. (3)

3.2 Define the term *amplitude.* (2)

3.3 Write down the amplitude of the wave. (1)

3.4 Give TWO points which are in phase. (1)

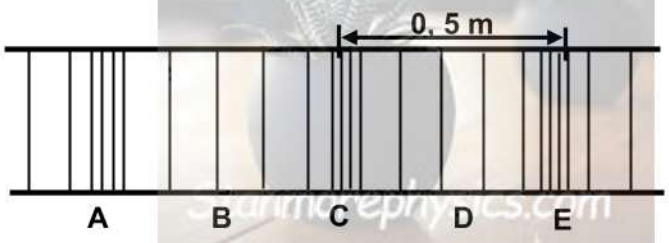
3.5 For this wave:

3.5.1 Write down the magnitude of its wavelength in metres (m). (1)

3.5.2 Calculate the wave speed. (5)
[13]

QUESTION 4

The diagram below shows the pattern obtained for a sound wave of frequency of 450 Hz



4.1 Is the wave represented in the diagram above a longitudinal or a transverse wave? (1)

4.2 Write down the name of the sections marked:

4.2.1 A. (1)

4.2.2 B. (1)

4.3 Write down TWO letters that represent two consecutive points on the wave which are in phase. (1)

4.4 Calculate the speed of this wave. (3)

4.5 A stationary bird emits sound which moves and hits the wall of a tall building. It takes 0, 02 s for the echoes to return to the bird. Take the speed of sound in air as 340 $m \cdot s^{-1}$.

4.5.1 Define the term *echoes*. (2)

4.5.2 Calculate how far the bird is from the wall. (4)

[13]

QUESTION 5

The table below shows some of electromagnetic radiations and their range of frequencies.

TYPE OF RADIATION	FREQUENCY (Hz)
Infrared (IR)	10^{11}–10^{14}
Ultraviolet (UV)	10^{15}–10^{16}
X-rays	10^{16}–10^{18}

5.1 Write down:

5.1.1 The source of electromagnetic waves. (1)

5.1.2 One property of electromagnetic waves. (1)

5.2 Which radiation in the table above has the highest energy? (1)

5.3 Calculate the energy of Infrared radiation if it penetrates an object with a specific frequency of 3,0 x 10^{13} Hz. (3)
[6]

TOTAL:50

INFORMATION FOR PHYSICAL SCIENCES GRADE 10

TABLE 1: PHYSICAL CONSTANTS

NAME	SYMBOL	VALUE
Gravitational acceleration	g	9,8 m·s^{-2}
Speed of light in vacuum	c	3,0 x 10^{8} m·s^{-1}

TABLE 2: FORMULAE: WAVES, LIGHT AND SOUND

$v = f\lambda$ **or** $v = \nu\lambda$	$T = \frac{1}{f}$ **or** $T = \frac{1}{\nu}$
$n = \frac{c}{v}$	

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PHYSICAL SCIENCES TOPIC TEST

TOPIC: WAVES, SOUND AND LIGHT

FEBRUARY 2023

MARKING GUIDELINES

MARKS: 50

This memorandum consists of 3 pages

QUESTION 1

1.1 C✓✓ (2)

1.2 B✓✓ (2)

1.3 D✓✓ (2)

1.4 A✓✓ (2)

[8]

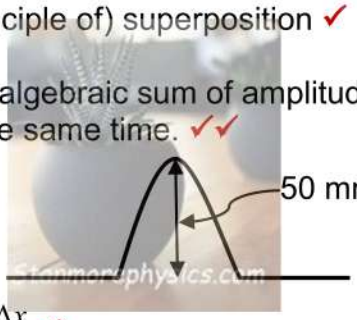
QUESTION 2

2.1 A single disturbance in a medium.✓✓ (2)

2.2 (Principle of) superposition ✓ (1)

2.3 The algebraic sum of amplitudes of two pulses that occupy the same space at the same time. ✓✓ (2)

2.4



Criteria for marking Q 2.4	
Correct shape	✓
Amplitude of 50 mm	✓

(2)

2.5 $v = \frac{\Delta x}{\Delta t}$ ✓

$v = \frac{0,8}{1,6}$ ✓

$\therefore v = 0,5\ m \cdot s^{-1}$ ✓

(3)

[10]

QUESTION 3

3.1 TRANSVERSE✓
The disturbance of the particles of the medium are perpendicular to the direction of propagation.✓✓ (3)

3.2 The maximum disturbance of a particle from the rest (equilibrium) position.✓✓ (2)

3.3 20 mm✓ (1)

3.4 S and U✓
OR: T and V (1)

3.5.1 200 mm = 0,2 m✓ (1)

3.5.2 **POSITIVE MARKING FROM Q 3.5.1**

$f = \frac{1}{T}$ ✓

$f = \frac{1}{1,5}$ ✓

f = 0, 67 Hz✓

$V = f\lambda$

V = 0, 67 (0,2)✓

V = 0, 134 m.s^{-1}✓

(5)

[13]

QUESTION 4

4.1 Longitudinal (wave). ✓ (1)

4.2.1 Compression. ✓ (1)

4.2.2 Rarefaction. ✓ (1)

4.3 A and C ✓ **OR:** C and E **OR:** B and D (1)

4.4 $V = f\lambda$ ✓

V= (450)(0,5) ✓

V= 225 m·s^{-1} ✓ (3)

4.5.1 Reflections of sound waves. ✓✓ (2)

4.5.2 $v = \frac{\Delta x}{\Delta t}$ ✓

$340 = \frac{\Delta x}{0,02}$ ✓

$\Delta x = 6,8$ m

Distance of bird from the wall = $\frac{6,8}{2}$ ✓ = 3, 4 m ✓ (4)

[13]

QUESTION 5

5.1.1 An accelerating charge. ✓ (1)

5.1.2
- Originates from accelerating (electric) charges ✓.
- It propagates as electric and magnetic fields perpendicular to each other.
- Can travel through vacuum
- Has a speed of 3 x 10^8 m·s^{-1} **[any one]** (1)

5.2 X-rays ✓ (1)

5.3 E = hf ✓

E = (6 ,63x 10^{-34})(3,0 x 10^{13}) ✓

E = 1,99 x 10^{-20} J ✓ (3)

[6]

TOTAL: 50